

TECHNICAL AND SOFT SKILL COMPETENCIES MAPPING AT THE ENTRY LEVEL OF DIPLOMA HOLDERS IN MECHANICAL AND AUTOMOBILE ENGINEERING FOR AUTO AND AUTO COMPONENTS INDUSTRIES

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ABSTRACT

The significance of industrialization was emphasized by the Government of India during 2nd five year plan to provide job opportunities for the vast majority of the people and to achieve economic growth. Globalisation paved ways for industrial growth, international trades, advancement of technology and innovations in industrial production. In order to maintain sustainability in cutthroat competitive environment, industries have to make quick response to the changed business environment, technology upgradation and maintain international standards for its production and servicing activities. Obviously, industry needs competent skilled human resources to overcome the challenges of 21st century. Industrial Training Institutes and Polytechnic Colleges are main sources of supplying skilled manpower for the industries to meet their shop floor demand. In competitive job market, providing competence based technical education to the diploma holders in engineering / technology during their study is emphasized for preparing them to match industries' demand.

Indian automotive industries are the significant contributors to the Indian economy and one of the largest in the world. As per the report of India Brand Equity Foundation (November, 2017), the automotive industries accounts for 7.1 percent of the country's Gross Domestic Product (GDP). The report also envisages the Indian automotive sector has the potential to generate up to US \$ 300 billion in annual revenue by 2026, create 65 million additional jobs and contribute over 12 percent to India's Gross Domestic Product (GDP). This paper focus on entry level technical and soft skill competencies required for auto and auto components industries for diploma holders in mechanical and automobile engineering passing out from polytechnic education. The paper also facilitates the educationist, policy makers and other nodal agencies to benchmark the existing polytechnic education in line with the competencies required for the industries and preparing the technicians to meet the vagaries of 21st century challenges.

KEYWORDS: Auto and auto components, Automotive, Competency, Competencies, Industry, Soft Skill, Technical Skill, Knowledge, Attitude & Diploma Holders

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INTRODUCTION

The technical education in our country at diploma level has taken paradigm change in providing value based education to diploma holders in engineering and technology (**in short diploma holders**) during their study in polytechnic college in meeting industries' competency demand. In present business environment, industries has to face the dual challenges of rapid technological advancement and developing skilled manpower to use such latest technology for increasing the organizational effectiveness. Despite efforts taken by the department of technical

education for periodical revamping the curriculum, but **the skill deficit continue to exist at the entry level of diploma holders entering to the industries after passing 3 years diploma study.** This needs close interaction between industries, technical institutions policy makers and nodal agencies for better understanding the significance of competencies required by the industries, benchmark the curriculum to identify the gap to formulate action plan for offering self-healing curriculum so that the diploma holders at the exit level of polytechnic college will match the industries competency requirement to avail the job opportunity in auto and auto components industries and support the industries for their sustainable growth.

Competence Concepts of Various Countries

According to European centre for development of vocational training (CEDEFOP, 2010) and World Bank group draft (2015) the definition of competency of various countries is listed in Table-1.

Table 1

Sl.no	Country	Definition of Competence
1	Germany	Competence of action taking is the principle aim of vocational education and training in dual system to enable the students to take autonomous and responsible action within the work place. It is a multi – dimensional concept comprising occupational and personal competence. Each of these dimensions relates to particular knowledge, skills and competencies. The later include moral and social attributes such as taking responsibility and showing awareness of the consequences of occupational action.
2	England	Competence relates not to overall capacity of the individual but to the individual's performance of prescribed tasks or skills to a defined standard.
3	France	Competences can be understood as dynamic processes of learning, developing and passing on knowledge. France has competence based Qualifications France work. Competences have been derived from job content analysis and serve as a basis for both curriculum development and assessment.
4	Cambodia	The skills standard required for effective performance in the work place. It goes beyond specifying knowledge, skills and attitude requirements in to defining the performance levels the workers in a particular job must achieve.
5	Indonesia	Competence is the knowledge, skills and attitude to be applied in the work place.
6	Malaysia	Competence is noted as an acquired and practised ability to competently carryout a task or job.
7	Lao PDR	Competence is the relevant knowledge, skills and attitude applied to the standards of the performance expected in the work place. Competence described the job tasks with in a specific job role.

Table: Contd.,		
8	Philippines	Competence is noted as capability or proficiency and refers to the application of knowledge, skills and attitude required to complete a work activity in a range of context and environment to the standard expected in the work place.
9	Singapore	Competence is a measurable set of knowledge, skills and attitude that drives an individual's performance to perform his / her job effectively.
10	Thailand	Competence is the required expected or accepted level of quality of processes or product of an individual presenting, or / and problem solving, hands – on demonstrating his capacity after learning / writing experience.

OBJECTIVES

The Objectives of this Paper are

- To identify the set of soft skills and technical competencies required for auto and auto component industries.
- To identify the level and degree of importance of competencies required for effective job performance in auto and auto component industries.
- To benchmark the existing curriculum for identifying competency deficit between the competencies required and accomplished.

METHODOLOGY

Based on the objectives of the study and insights obtained in the review of related literature, a descriptive survey methodology research was adopted for this research.

Sample

A sample refers to a subset of a population. For this study, 44 industrial executives from 20 auto and auto component industries in and around Chennai were taken for the study.

Purposive sampling technique was used in this study. It is widely used in social science research / educational research. Purposive sampling technique is the process of selecting a sample that is believed to be representative of a given population (Gay and Airasian, 2006).

Profile of Sample

The sample profile of **twenty industries** in and around Chennai have been selected for this survey. The industries consisting of **five major automobile industries** namely 1. Ashok Leyland, 2. Hyundai Motor India Limited, 3. Ford India Limited, 4. Renault Nissan Automotive India Private Limited, 5. TVS Motor Company Limited which are manufacturing automobile cars, commercial vehicles and two wheelers. **Other 15 industries are auto components** manufacturing industries supplying components to the major automobile industries. From the above referred industries, 44 executives of Human Resource and Production Departments in equal numbers who are directly involved in recruitment of diploma

holders and assessing their competencies at the entry level and providing upskilling and reskilling activities in the industries were identified for this survey.

Research Tools for Data Collection

The following tools were constructed used in the study

- Questionnaire for soft skill competencies
- Questionnaire for technical competencies

Construction of Research Tools

Based on the vast experience of researcher in skill development more than 2 decades, review of literature, consultation with around 200 industries executives including subject matter experts and the guide, the researcher has developed 16 sub head competencies for questionnaire 1 and the same are grouped in 8 major heads namely 1.personality development, 2.smartness, 3.team building, 4.positive attitude, 5.achieve target, 6.rational thinking, 7.honesty and sincerity, 8.language proficiency. Similarly, researcher developed 27 technical sub head competencies for questionnaire 2 and the same are grouped in 8 major heads namely 1.skills on industrial practices, 2.product and process knowledge and skills, 3.skills on manufacturing techniques, 4.material handling, stores and inventory management, 5.quality control, 6.multi skills, 7.knowledge on latest application tools, 8.skill on online examination. Questionnaire refers to a device for securing answers to the questions by using a form which the respondents fills himself / herself.

Competency Definition

The definition of competency according to **David McClelland (1973)** is an underlying characteristic of a person which enable them to deliver superior performance in a given job, role, or situation. Competency is a set of defined behaviours that provide a structured guide enabling the identification evaluation and development of the behaviour in individual employees (**Craig C. Lundberg, 1970**) in “Planning the Executive Development Program “. According to National Skill Development Corporation of India (2009), the definition of competency is the consistent application of knowledge and skill to the standard of performance required in the work place. It embodies the ability to transfer and apply skills and knowledge to new situations and environments. **According to Gazette of India (2013)** competency means the proven ability to use acquired knowledge, skills, personal and social abilities in discharge of responsibility roles. It is the ability to do a job well.

Validity of the Instruments

The content validity of each of the instruments was determined by jury opinion. For this purpose, a panel of jury consisting of the following members was constituted:

- The Supervisor / Guide
- Five Industrial Expert
- Two Academicians

Based on the feedback provided by the jury, certain modifications were made to enrich the content validity of the instruments.

Reliability

Reliability refers to consistence of the tool. The reliability of two instruments was determined by test and retest method. The questionnaire was administered twice to the ten industries executives within an interval of 15 days. The correlation coefficient between the two set of scores were presented below:

- Questionnaire for technical competencies - 0.85
- Questionnaire for soft skill competencies – 0.80
- The correlation coefficient are 0.80 and 0.85, therefore the tool is highly reliable.

Procedure

The identified executives were explained the object and purpose of the study before mailing the questionnaires to them. The data has been collected from above mentioned 44 executives with regard to the competency requirement of **16 soft skills and 27 technical skills** competency at the entry level of diploma holders in mechanical and automobile engineering after passing 3 years diploma study from polytechnic college for auto and auto components industries. From the statements, the mode value, average value and minimum and maximum competency requirement have been calculated for respective skill set for further analysis.

ANALYSIS AND INTERPRETATION

Knowledge, Skills and Attitude

It is appropriate to explain the terms of knowledge, skills and attitude. **Knowledge** means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that related to a field of work or study. **Skills** means ability to apply knowledge and use know – how to complete tasks and solve problems. **Attitude means** a settled way of thinking or feeling about something **Soft skill competency**

The excel statement has been prepared based on the values recorded by the participants against each soft skill competency. The average and mode values have been calculated for each competency. **Soft skill competency requirement (soft skill - core)** at the entry level of diploma holders in mechanical and automobile engineering for auto and auto component industries were measured in 10 points scale, the numerical value “1” refers to base value competency and the value “10” refers to maximum competency required. 16 soft skill competencies has been classified as sub head competencies and the same are grouped under 8 major heads. Each major head consisting of 2 sub head competencies. The details are furnished in the following table – 2.

The following table shows the details of major and sub head soft skill competencies, total value, average value, minimum and maximum competency value recorded by the participants and mode value

Table: 2

Sl. no	Soft Skill Competency		Total value of 44 respondents	Average round off value	Minimum & Maximum value	Mode value
	Major Head	Sub Head				
1	Personality Development	1.1.Communication	273	6	4 - 9	5
		1.2. Presentation	244	5	4 - 9	5
2	Smartness	2.1. Assertiveness	276	6	4 - 10	7
		2.2.Analytical ability	284	6	5 - 10	7
3	Team Building	3.1. Creativity	279	6	5 - 10	7
		3.2. Interpersonal	279	6	3 - 10	6
4	Positive Attitude	4.1.Continuous LearLearning	317	7	5 - 10	10
		4.2.Adapt to change	318	7	5 - 10	10
5	Achieve Target	5.1. Goal Setting	296	7	3 - 10	7
		5.2.Time Management	335	8	4 - 10	8
6	Rational Thinking	6.1.Decision Making	268	6	3 - 10	7
		6.2.Problem Solving	290	6	4 - 10	5
7	Honesty and Sincerity	7.1. Integrity	363	8	5 - 10	10
		7.2. Commitment	352	8	4 - 10	10
8	Language Proficiency	8.1.Mother Tongue	335	8	5 - 10	8
		8.2. Proficiency in English	270	6	4 - 10	6

Inferences on Soft Skill Competency

It is inferred from the above table that average value of competency ranging between 5 and 8. The minimum and maximum competency values are 3 and 10. The competency of time management, integrity, commitment and mother tongue proficiency scored the maximum average value of 8. The communication, assertiveness, analytical ability creativity, interpersonal skill, decision making, problem solving and proficiency in English scored the average competency value of 6. The competency of continuous learning, adapt to change and goal setting scored average competency value of 7. With respect to mode value, the communication and presentation competency scored the mode value of 5. Interpersonal competency scored the mode value of 6. The assertiveness, analytical ability, creativity, goal setting and decision making competencies scored the mode value of 7. Time management and mother tongue proficiency scored the average value of 8. Significantly, competencies of continuous learning, adapt to change, integrity and commitment scored the maximum competency value of 10.

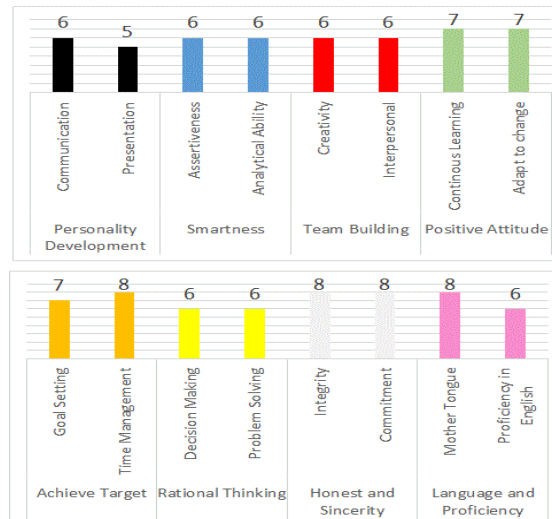


Figure: The Pictorial Representation of Average Soft Skill Competencies

The following graph – 1 represents the relationship between softs skill competency (X – axis) and average competency value (Y – axis). The graph shows the competency pattern with respect to average value. Time management, integrity, commitment and mother tongue proficiency scored the maximum average value of 8.

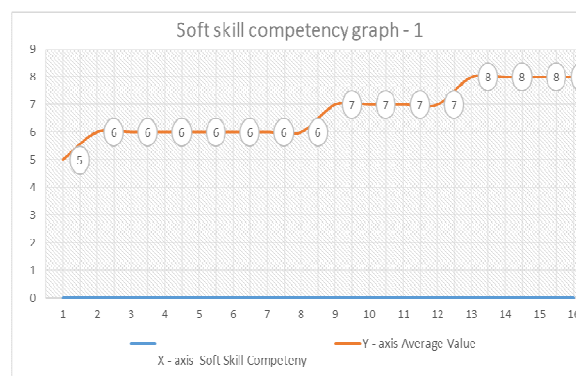


Table: 3: The table Shows the Relationship Between the Number 1 to 16 given in X – axis and Corresponding the Competency Mentioned in table – 2

Reference Value in X - axis	Corresponding Competency with Reference to Table - 2	Reference Value in X - axis	Corresponding Competency with Reference to Table – 2
1	1.2. Presentation	9	4.1. Continuous LearLearning
2	1.1. Communication	10	4.2. Adapt to change
3	2.1. Assertiveness	11	5.1. Goal Setting
4	2.2. Analytical ability	12	8.2. Proficiency in English
5	3.1. Creativity	13	5.2. Time Management
6	3.2. Interpersonal	14	7.1. Integrity
7	6.1. Decision Making	15	7.2. Commitment
8	6.2. Problem Solving	16	8.1. Mother Tongue

Technical competency requirement (technical - core) at the entry level of diploma holders in mechanical and automobile engineering for auto and auto component industries were measured in 10 points scale, the numerical value “1” refers to base value competency and the numerical value “10” refers to maximum competency value.

The following table shows the details of technical competencies, total value, average value, minimum and maximum competency value recorded by the participants and mode value.

Table: 4

Sl. no	Technical Skill Competency		Total value of 44 respondents	Average round off value	Minimum & Maximum value	Mode value
	Major Head	Sub Head				
1	Skills on Industrial Practices	1.1. 5 S / 6 S for good house keeping	279	6	3 - 10	5
		1.2. Kaizen for continuous improvement	267	6	2 - 10	5
		1.3. Total Productive Maintenance (TP (TPM)	254	6	2 - 10	5
		1.4. POKO-YOKE (Mistake Proof)	270	6	3 - 10	5
		1.5. Quality Circle	259	6	3 - 10	5
		1.6. Total Quality Management (TQM)(TQM)	260	6	2 - 10	5
		1.7. ISO Standards	254	6	2 - 10	5
2.	Product and Process Knowledge and Skill	2.1. Fundamentals of Products and its aits application.	247	6	2 - 9	5
		2.2. Ability to read technical drawidrawings	264	6	3 - 10	5
		2.3. Ability to read and understand n standard operation procedure)(SOP)	273	6	3 - 10	5
		2.4. Process Planning and Control	238	5	3 - 9	5
		2.5. Basic Materials and its applications.	251	6	3 - 10	5
3.	Skill on Manufacturing Techniques	3.1. Welding Techniques • Arc, MIG / MAG, TIG, Spot, Pro Projection, Robotics / Auto Automobile techniques	289	6	3 - 10	5
		3.2. Machining Techniques (con(ventional) • Fundamentals of Lubricants and coolants Conventional Machine Operations	275	6	3 - 10	5
		3.3. Machining Techniques ((Advanced) • Computer Numerical Control (CNC). Special Purpose Machine (SPM) Operations. Tool and Die.	268	6	2 - 10	5
4.	Material Handling, stores and Inventory	4.1. Knowledge on Material Handling equipments and its app its application	281	6	2 - 10	5
		4.2. Inventory Control and store e procedures.	253	6	2 - 10	5
5.	Quality Control	5.1. Knowledge and Skill on Measuring Instruments / gauges etc.	280	6	3 - 10	5
		5.2. Quality Control tools and its application.	271	6	2 - 10	5
6.	Multi Skills	2.6.1. Machine Maintenance	249	6	2 - 10	4
		2.6.2. Basic Instrumentation	256	6	3 - 10	5
		2.6.3. Basic Electricals and applicapplications	244	6	2 -10	5
		2.6.4. Assembling Technique Skills	257	6	2 - 10	5
		2.6.5. Knowledge on Painting techni techniques	229	5	2 - 10	4

Table 4: Contd.,						
7.	Knowledge on Latest application Tools	7.1. Enterprise Resource Planning (ERP) ()(ERP)	208	5	2 - 10	5
		7.2. System Application Products (SAP)	209	5	2 - 10	4
8.	Skill on Online Examination	8.1. Ability to take up online ExamExamination.	238	5	2 - 10	5

The following charts 2.1 to 2.7 represents Technical skill competencies of major and sub heads. Major Head serial no. 8, Skill on online Examination has single sub head (Ability to take up online examination).



Chart: 2.1

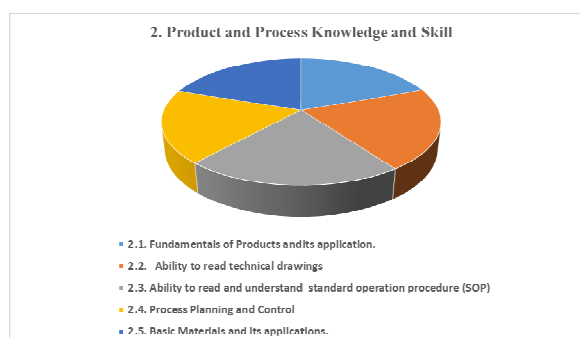


Chart: 2.2

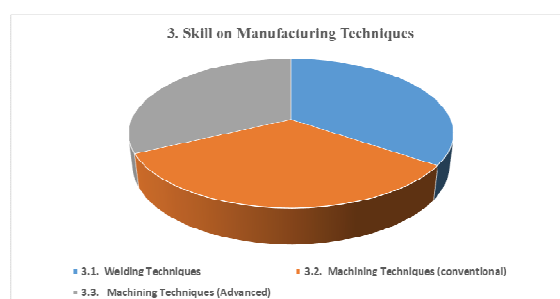
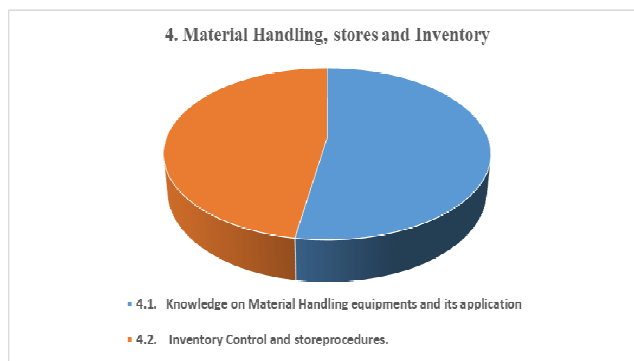
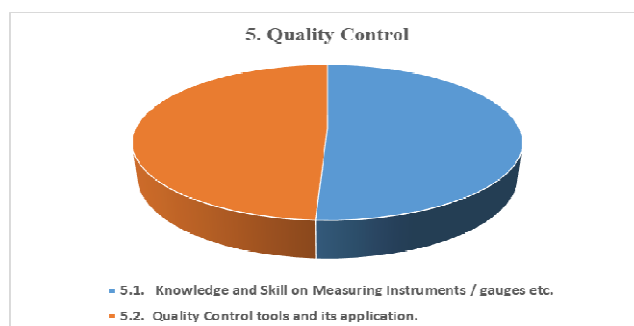
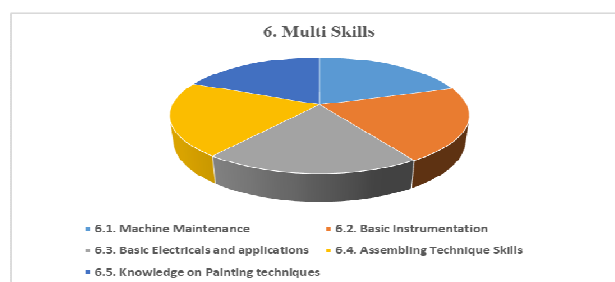
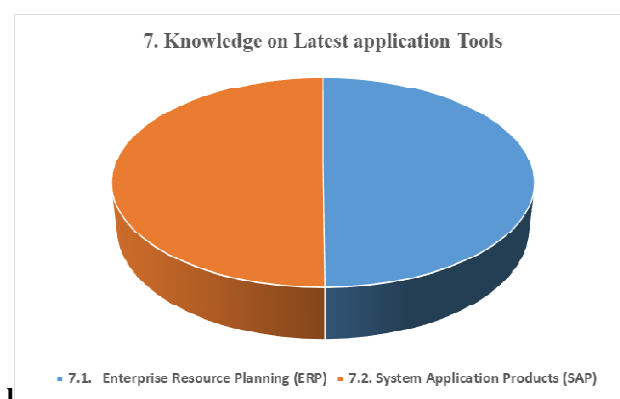


Chart: 2.3

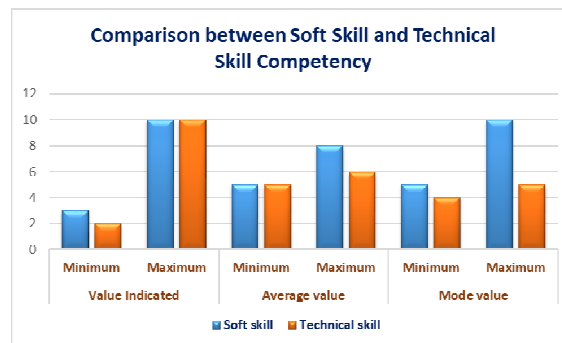
**Chart: 2.4****Chart: 2.5****Chart: 2.6****Chart – 2.7**

Inferences on Technical Skill Competency

The table – 4 shows the average competency values are 5 and 6. Process planning and control, knowledge on painting techniques, enterprise resource planning (ERP), System application products (SAP) and ability to take up online examination scored the average value of 5 and all other 22 competencies scored the average value of 6. The minimum and maximum competency values are 2 and 10. It is inferred from the table that competency of machine maintenance, knowledge on painting techniques and system application products (SAP) scored the mode value of 4. All other 22 competencies significantly scored the mode value of 5.

Table: 5: Minimum & Maximum Values, Average and Mode Values – Comparison

Competency	Value Indicated		Average Value		Mode Value	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Soft skill	3	10	5	8	5	10
Technical skill	2	10	5	6	4	5



COMPARISON BETWEEN SOFT SKILL AND TECHNICAL SKILL

Soft Skill Competency

The study shows the industries prefer high soft skill competency than technical. The minimum competency requirement is “3” and maximum is “10”. It is worth to mention that 7 competencies (88%) have the highest rating of 10. Only one competency that is personality development has the next descending order value “9”. Significantly, positive attitude and honesty and sincerity have the highest mode value 10. Similarly, time management, integrity, commitment and mother tongue proficiency scored highest average value of 8.

Technical Skill Competency

Competencies of process planning and control, knowledge on painting techniques, enterprise resource planning (ERP) and system application products (SAP) have average value “5”, rest of 22 (82%) competencies have the average value of “6”. The minimum competency value is “2” and maximum value is “10”. Similarly, only two competencies namely knowledge on painting techniques and system application products (SAP) have mode value “4” and rest of the competencies mode value is “5”.

CONCLUSIONS

It is seen from the study, in the present business environment auto and automobile industries require both soft skill and technical skill competencies at the entry level of diploma holders. However, soft skill competency requirement

has significant importance than technical skills. Therefore, the technical institutions, authorities and nodal agencies needs to have continuous interaction with industries for making self-healing curriculum and establish standard evaluation and certification system to ensure that the diploma holders acquired sufficient technical and soft skill competencies during their diploma study. The above competency mapping in diploma level technical education will increase the job opportunity of diploma holders and also improve the organizational effectiveness of auto and auto component industries for sustainable economic growth.

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